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TITLE: Coformulation of carfentrazone-ethyl and a water-soluble herbicide

Summary of Invention Paragraph (29):

[0026] The oil phase of a composition of the present invention comprises a solvent having an oil-soluble herbicidal active ingredient dissolved therein. Oil-soluble herbicides suitable for use in compositions of the present invention include but are not limited to acetochlor, aclonifen, alachlor, ametryn, amidosulfuron, anilofos, atrazine, azafenidin, azimsulfuron, benfluralin, benfuresate, bensulfuron-methyl, bensulide, benzfendizone, benzofenap, bifenox, bromobutide, bromofenoxim, butachlor, butafenacil, butamifos, butralin, butroxydim, butylate, cafenstrole, carfentrazone-ethyl, carbetamide, chlomethoxyfen, chlorbromuron, chloridazon, chlorimuron-ethyl, chlorotoluron, chlornitrofen, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, clethodim, clodinafop-propargyl, clomazone, clomeprop, cloransulam-methyl, cyanazine, cycloate, cyclosulfamuron, cycloxydim, cyhalofop-butyl, daimuron, desmedipham, desmetryn, dichlobenil, diclofop-methyl, diflufenican, dimefuron, dimepiperate, dimethachlor, dimethametryn, dimethenamid, dinitramine, dinoterb, diphenamid, dithiopyr, diuron, EPTC, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethofumesate, ethoxysulfuron, etobenzanid, fenoxaprop-ethyl, fenuron, flamprop-methyl, flazasulfuron, fluazifop-butyl, fluazifop-P-butyl, fluazolate, fluchloralin, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, fluorochloridone, fluoroglycofen-ethyl, flupoxam, flurenol, fluridone, fluroxypyr-1-methylheptyl, flurtamone, fluthiacet-methyl, fomesafen, graminicides, halosafen, halosulfuron, haloxyfop, hexazinone, imazosulfuron, indanofan, isoproturon, isouron, isoxaben, isoxaflutole, isoxapyrifop, lactofen, lenacil, linuron, mefenacet, metamitron, metazachlor, methabenzthiazuron, methyldymron, metobenzuron, metobromuron, metolachlor, metosulam, metoxuron, metribuzin, metsulfuron, molinate, monolinuron, naproanilide, napropamide, neburon, nicosulfuron, norflurazon, orbencarb, oryzalin, oxadiargyl, oxadiazon, oxasulfuron, oxyfluorfen, pebulate, pendimethalin, pentanochlor, pentoxazone, phenmedipham, piperophos, pretilachlor, primisulfuron, prodiamine, profluazol, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propyzamide, prosulfocarb, prosulfuron, pyraflufen-ethyl, pyrazogyl, pyrazolynate, pyrazosulfuron-ethyl, pyrazoxyfen, pyributicarb, pyridate, pyriminobac-methyl, quinclorac, quinmerac, quizalofop, quizalofop-P, rimsulfuron, sethoxydim, siduron, simazine, simetryn, sulcotrione, sulfentrazone, sulfometuron, sulfosulfuron, tebutam, tebuthiuron, tepraloxydim, terbacil, terbumeton, terbuthylazine, terbutryn, thenylchlor, thiazopyr, thidiazimin, thifensulfuron, thiobencarb, tiocarbazil, tralkoxydim, triallate, triasulfuron, tribenuron, trietazine, trifluralin, triflusulfuron and vernolate.

Summary of Invention Paragraph (30):

[0027] Preferred oil-soluble herbicides for use in a composition of the invention include but are not limited to acetochlor, aclonifen, alachlor, ametryn, amidosulfuron, anilofos, atrazine, azafenidin, azimsulfuron, benfluralin, benfuresate, bensulfuron-methyl, bensulide, benzfendizone, benzofenap, bromobutide, bromofenoxim, butachlor, butafenacil, butamifos, butralin, butroxydim, butylate, cafenstrole, carfentrazone-ethyl, carbetamide, chlorbromuron, chloridazon, chlorimuron-ethyl, chlorotoluron, chlornitrofen, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, clethodim, clodinafop-propargyl, clomazone, clomeprop,

cloransulam-methyl, cyanazine, cycloate, cyclosulfamuron, cycloxydim, cyhalofop-butyl, daimuron, desmedipham, desmetryn, dichlobenil, diclofop-methyl, diflufenican, dimefuron, dimepiperate, dimethachlor, dimethametryn, dimethenamid, dinitramine, dinoterb, diphenamid, dithiopyr, diuron, EPTC, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethofumesate, ethoxysulfuron, etobenzanid, fenoxaprop-ethyl, fenuron, flamprop-methyl, flazasulfuron, fluazifop-butyl, fluazifop-P-butyl, fluazolate, fluchloralin, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, fluorochloridone, flupoxam, flurenol, fluridone, fluroxypyr-1-methylhepty- 1, flurtamone, fluthiacet-methyl, graminicides, halosulfuron, haloxyfop, hexazinone, imazosulfuron, indanofan, isoproturon, isouron, isoxaben, isoxaflutole, isoxapyrifop, lenacil, linuron, mefenacet, metamitron, metazachlor, methabenzthiazuron, methyldymron, metobenzuron, metobromuron, metolachlor, metosulam, metoxuron, metribuzin, metsulfuron, molinate, monolinuron, naproanilide, napropamide, neburon, nicosulfuron, norflurazon, orbencarb, oryzalin, oxadiargyl, oxadiazon, oxasulfuron, pebulate, pendimethalin, pentanochlor, pentoxazone, phenmedipham, piperophos, pretilachlor, primisulfuron, prodiamine, profluazol, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propyzamide, prosulfocarb, prosulfuron, pyraflufen-ethyl, pyrazogyl, pyrazolynate, pyrazosulfuron-ethyl, pyrazoxyfen, pyributicarb, pyridate, pyriminobac-methyl, quinclorac, quinmerac, quizalofop, quizalofop-P, rimsulfuron, sethoxydim, siduron, simazine, simetryn, sulcotrione, sulfentrazone, sulfometuron, sulfosulfuron, tebutam, tebuthiuron, tepraloxydim, terbacil, terbumeton, terbuthylazine, terbutryn, thenylchlor, thiazopyr, thidiazimin, thifensulfuron, thiobencarb, tiocarbazil, tralkoxydim, triallate, triasulfuron, tribenuron, trietazine, trifluralin, triflusulfuron and vernolate.

Summary of Invention Paragraph (31):

[0028] Another class of preferred oil-soluble herbicides for use in a composition of the invention are protoporyphinogen oxidase inhibitor (PPO) herbicides. PPO herbicides are known to affect plants by inhibiting protoporphyrinogen oxidase in chloroplasts, thereby disrupting photosynthesis and other biological processes and causing early symptoms of tissue necrosis in plants. General classes of PPO herbicides include diphenylether herbicides (e.g., bifenox, chlomethoxyfen, fluoroglycofen-ethyl, fomesafen, halosafen, lactofen and oxyfluorfen); phenylpyrazoles (e.g., fluazolate and pyraflufen-ethyl); N-phenylphthalimides (e.g., cinidon-ethyl, flumioxazin and flumiclorac-pentyl); thiadiazoles (e.g., fluthiacet-methyl and thidiazimin); oxadiazoles (e.g., oxadiazon and oxadiargyl); triazolinones (e.g., azafenidin, carfentrazone-ethyl and sulfentrazone); oxazolidinediones (e.g., pentoxazone); pyrimidindiones (e.g., benzfendizone and butafencil); pyrazogyl and profluazol.

Summary of Invention Paragraph (32):

[0029] A particularly preferred class of PPO herbicides are the triazolinones. Triazolinone herbicides are known to provide good control of broadleaf weeds but are less efficacious in controlling grasses. Suitable triazolinone herbicides for use in compositions of the invention are described generally in U.S. Pat. Nos. 5,217,520 and 5,125,958 to Poss and U.S. Pat. No. 4,818,275 to Theodoridis, all of which are hereby incorporated herein by reference. A triazolinone herbicide suitable for use in a composition of the invention can be a compound of the structure shown in the following formula: 1

Summary of Invention Paragraph (36):

[0033] In a composition of the invention, the herbicidal active ingredients are generally present in an amount which is biologically effective when the composition is diluted in a suitable volume of water and applied to the foliage of a susceptible plant. Typically, the oil-soluble herbicide is present in a concentration such that the weight ratio of water-soluble herbicide to oil-soluble herbicide ranges from about 190:1 to about 1: 1. For example, when the oil-soluble herbicide is a PPO herbicide such as a triazolinone, the weight ratio of triazolinone to water-soluble herbicide ranges from about 190:1 to about 19: 1. In any case, the concentration of the oil-soluble herbicide in the composition as a whole is about0.1% to about 25% by weight. In preferred compositions, the concentration of the oil-soluble herbicide is about 0.1% to about 5% by weight, for example about 0.2% to about 2% by weight.

Summary of Invention Paragraph (66):

[0063] In a particularly preferred composition of the invention, the oil-soluble herbicide is carfentrazone-ethyl, a \underline{PPO} herbicide of the triazolinone class, and the water-soluble herbicide is a salt of \overline{N} -(phosphonomethyl)glycine ("glyphosate").